

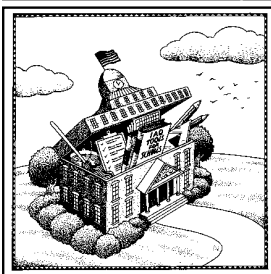


## CASE STUDY

### FAIRGROUNDS JUNIOR HIGH SCHOOL

*Nashua School District, Nashua, New Hampshire*

#### Indoor Air Quality



#### Tools for Schools

Targeted by the local health department for having poor indoor air quality (IAQ), Fairgrounds Junior High School underwent renovations between 1996 and 1997. The school installed a new ventilation system, replaced the roof, and added classroom space. The ventilation system supplies classrooms with 100-percent fresh air, and it is equipped with a dehumidification system to temper the air during humid months. The air exiting the rooms is completely exhausted to the outside.

In May 1997 after the renovations, teachers came forward with IAQ-related complaints, ranging from fluctuating temperatures to diesel odors from idling buses that affected the air in their classrooms. To correct these problems, school facilities staff adjusted the Energy Management System (EMS) shortly before school closed for the summer. However, when school reopened in early September, complaints about temperature discomfort and odors resurfaced, along with complaints of dizziness and tingling sensations in the extremities.

School officials became concerned that much broader IAQ problems existed than they had realized.

***“The process described in the IAQ TFS Kit was an effective way of documenting and supporting the District’s claim that a problem existed with the fresh air intake.”***

*-Jeanette Kotopoulis,  
Assistant Director,  
Plant Operations*

### Approach—Project Description

#### ***School Description***

Located in the southern part of New Hampshire, Nashua is the second largest city in the State. The Nashua School District consists of 16 schools serving approximately 13,000 students.

Built in the early 1960s, Fairgrounds Junior High School is a one-story building with a flat roof. During the 2000-2001 school year, approximately 1,000 students attended grades 7-9 at Fairgrounds, the second largest junior high school in the District. The building, which measures 119,000 square feet, is separated into three distinct wings for each grade taught at the school. The school has approximately 100 employees.

#### ***IAQ Team***

Nashua School District officials knew about IAQ issues, having piloted EPA’s *Indoor Air Quality Tools for Schools (IAQ TFS)* Program and Kit in 1995 at Pennichuck Junior High School. At that time, they collaborated with the New Hampshire Coalition for Occupational Safety and Health (NHCOSH) and New Hampshire’s Department of Environmental Services. Due to the pilot program’s success, the District decided in 1997 to implement the *IAQ TFS* Kit at Fairgrounds Junior High School to address ongoing IAQ problems.

The school principal and two teachers introduced the *IAQ TFS* Program at a staff meeting. They asked for volunteers to join the IAQ Team, which would be the foundation for implementing the *IAQ TFS* Kit. Fairground’s IAQ Team included three teachers, the principal, and the school nurse. The District’s Assistant Director of Plant Operations, who had assisted the Pennichuck IAQ Team during the pilot program, served as the IAQ Coordinator for Fairgrounds.

#### ***Problem Identification***

The IAQ Team distributed a health survey to teachers and staff at a faculty meeting, requesting information about health problems experienced during work hours.

From the completed health surveys, the IAQ Team realized that certain symptoms—lightheadedness, tingling of the extremities, rapid heart palpitations—were unique to teachers working in the 9th grade wing. The classrooms there were warm, and exhaust odors permeated the space at various times.

Examining the air-handling unit (AHU) located in the 9th grade wing of the school, the Team discovered that three of the six coils were defective as a result of improper manufacturing or installation. These defects caused freon to leak from the AHU and leave insufficient charges in the coils. As a result, the rooms were not properly dehumidified or cooled.

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***The IAQ TFS  
Kit educated  
the IAQ Team  
about  
identifying  
IAQ problems,  
giving them  
the leverage  
they needed to  
prove that the  
ventilation  
system was  
malfunctioning  
in the 9th  
grade wing.***

The IAQ Team also discovered that the fresh air intake for the 9th grade wing was close to a small parking lot and a road. The Team believed that bus traffic in front of the school and traffic to and from the elementary school across the street might be a contributing factor, so they decided to test the classroom carbon dioxide (CO<sub>2</sub>) levels using a fresh air diffuser. Because the new ventilation system delivered 100-percent fresh air to the classrooms, the CO<sub>2</sub> levels of the classroom [discharged] air should have been equal to the outside CO<sub>2</sub> levels, typically ranging from 350 to 450 parts per million (ppm).

For most of the day, classroom CO<sub>2</sub> levels were consistent with normal levels for outside air; however, spikes occurred when buses were idling in the bus loop or when other vehicles were idling in the parking lot. In fact, these spikes represented a rapid, significant rise in CO<sub>2</sub> by 250-350 ppm. Further investigation showed that the fresh air intake for the 9th grade wing was located downwind from the bus loop and the elementary school across the street. As many as 25 to 30 cars idled in front of the fresh air intake several times a day to pick up and drop off students enrolled in the school.

After reviewing the CO<sub>2</sub> data, the Team reasoned that the following factors must have been overlooked when the new ventilation system was installed:

- Bus traffic to the elementary school across the street.
- Kindergarten traffic during the middle of the day.
- Total amount of vehicle traffic near the junior high school.

Odor problems were also noted in the 7th and 8th grade wings of the school and the IAQ Team also discovered that some of the roof insulation had not been removed during renovations and that parts of the roof had collapsed, allowing water to seep in from poor drainage. Improperly installed roof drains were found over the cafeteria, which created mildew odors, leaks, and stained ceiling tiles.

### Lessons Learned

#### ***Short-Term Solutions***

Using the *IAQ TFS* Kit enabled the IAQ team to identify problems and gave them the leverage to prove that the ventilation system was malfunctioning in the 9th grade wing. The health survey and formal investigations led to the prompt identification of problems. Fortunately, repairs to the roof and ventilation system fell within the one-year warranty time frame and were performed at no charge to the District.

The contractors who installed the system agreed that vehicle traffic significantly affected the fresh air intake in the 9th grade wing, reflecting a design flaw. As an effective temporary measure, charcoal filters were installed in the air-handling unit to absorb the fumes until the air intake was relocated to roof in the summer of 1998.

In 2000, Fairgrounds Junior High School replaced the insulation and roofing in the 7th and 8th grade wings and repaired the roof drains over the cafeteria.

#### ***Long-Term Practices and Policies***

The relocation of the fresh air intake successfully addressed all the odor issues in the 9th grade wing. Teachers and staff have not reported temperature or odor problems in any section of the school since the improvements took place. Because contractors' warranties covered most of the repairs and upgrades, the District avoided significant repair costs. Staff at Fairgrounds were thrilled to have identified the problems in a timely manner by using the *IAQ TFS* Kit.

Since the initial pilot in 1995, nine additional Nashua School District schools have implemented the *IAQ TFS* Program.

***For more information, contact:***

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